Steven Bond and Associates, Inc.
Consulting Geologists, Groundwater and Water Quality Experts
P.O. Box 7023, Santa Cruz, CA 95061 v:(831) 458-1662, f:(831) 536-1021 bondassociates@mac.com

26 June 2006

Central Valley Regional Water Quality Control Board
Mr. William Marshall wmarshall@waterboards.ca.gov
Ms. Sue McConnell smcconnell@waterboards.ca.gov
Mr. Philip Giovannini pgiovannini@waterboards.ca.gov
11020 Sun Center Drive 200
Rancho Cordova, CA 95670-6114

Subject: May 2006 Revised Tentative Waste Discharge Requirements for Port of Stockton West Complex Dock Dredging Project, San Joaquin County

I have reviewed the most recent reports referenced in the May 2006 Revised Report of Waste Discharge. In addition, I have also reviewed the 2004 Tentative Waste Discharge Requirements, it's attachments, and the referenced reports.

In September 2004 and in October 2004 I presented this Board written comments discussing technical and regulatory issues about the the Port's dredging proposals including the applicability the characterization and classification of the wastes proposed for discharge into waste management units (WMU's), the siting of the WMU's, the groundwater chemistry, groundwater flow and contaminant transport of soluble pollutants from the WMU through groundwater, the physical and chemical characteristics of the material underlying the WMU's, the compatibility of the above items with the requirements of Title 27 and Title 23 of the CCR, and the

Regional Water Quality Control Plan (Basin Plan).

I am addressing my comments to the issues associated with dredge spoil characterization, disposal, groundwater quality and monitoring, and the transport of metals through geologic media.

The dredge spoils are designated wastes

The undisputed facts are

(1) The dredge spoils (wastes) contain soluble contaminants that can be released in concentrations exceeding applicable water quality objectives.
(2) The disposal areas are waste management units (WMU's) also defined in Title 27 and in Porter-Cologne Water Quality Control Act,
(3) The The geologic media underlying RN-1/DMD does not isolate the leachate from the wastes from the waters of the state. The RN-1/DMD is not underlain by natural geologic materials which have a hydraulic conductivity of not more than 1x10-6 cm/sec
(4) The wastes will not be underlain by natural geologic materials which are of sufficient thickness to prevent vertical movement of fluid, including waste and leachate, from WMU's to waters of the state,
(5) The WMU's remain in the same location and groundwater is essentially the same depth as in earlier versions of the RWD.

The point of dispute regarding the waste materials:
Whether the wastes are designated wastes within the meaning of the term defined in Title 27.

To that end the Port revised the RWD by doing the following:
(1) Reducing the size of the project and selecting different dredging areas.

(2) The Port modified the stated conditions of the disposal aspect of the project by arranging to use the dredge spoils as construction fill in two projects in the near vicinity of the Port and transfer the dredge wastes from the WMU's (RN-1/DMD) by 31 October 2006.
(3) The Port also had a modeling study of metal cation transport through the vadose zone to groundwater conducted to demonstrate mitigating factors associated with the geologic media.
(4) The Port also compared results of diluted, modified, waste extraction tests (de-ionized water WET) to a broad range of water supply water source chemistry found in San Joaquin county in lieu of establishing background conditions.
(5) The Port presented an informal argument that suggests that the Basin Plan has incorrectly identified certain beneficial uses: municipal use, domestic use, and agricultural use as beneficial uses of certain groundwaters of the delta.
(6) The Port also installed additional monitoring wells and drilled a number of borings to further the definition of groundwater conditions.

I. With respect item(1): modified size of the project and dredging areas.

A. The dredge wastes have the same general characteristics as the earlier versions of the RWD and the location of disposal/storage of dredge wastes.

B. The changes made to the project do not change the physical properties of the geologic materials underlying project site (RN-1, aka the DMD). The site(s) continue to be underlain by natural geologic materials which have a hydraulic conductivity of greater than 1x10-6 cm/sec, and the geologic media underlying the RN-1 continues to not isolate the leachate from the dredge spoils from the waters of the state. Consequently, The WMU's require a liner system which conforms to the requirements of Title

27 with a hydraulic conductivity of not more than 1x10-6 cm/sec because the natural geologic materials do not satisfy this requirement.

II. With respect to item (2): transfer of the dredge wastes by 31 October 2006

A. The project contemplates removal of the waste materials for placement into two construction projects (Dagget Road and Neugebauer Road), However, these sites are shown to have similar or the same characteristics as the project disposal site which is not protective of water quality and not suitable for the disposal of designated wastes.

1. The line of reasoning presented in Finding #38 that the transfer of dredge wastes by 31 October 2006 (to another location in the same area underlain by equal or similar geologic materials) provides a safety factor, is a fallacious argument. (1) The wastes will have drained the polluted pore water to groundwater at RN-1/DMD, and (2) there is no commitment that at the transfer sites of Dagget road and Neugebauer road the wastes will be encapsulated or even covered before the rains begin.

2. The Port proposes to remove the designated waste dredge materials and transfer them to the two construction sites by the beginning of the Rain Season. However, the Port does not contemplate protecting the wastes from rainfall and the construction project schedules are not known to begin before the following season. Consequently, the dredge wastes will be subject to re-wetting, oxidation and leaching from the new sites. Therefore, the wastes placed in the new sites pose a threat to groundwater quality, and possibly surface water quality as well. There are no provisions in

the RWD to guarantee proper handling of the wastes once they are transferred

III. With respect to item (3): The Port also had a modeling study of metal cation transport through the vadose zone to groundwater conducted to demonstrate mitigating factors associated with the geologic media. The conclusions of the study was that the geologic media underlying the RN-1/DMD site and the transfer locations at Dagget and Neugebauer roads had excessive cation exchange capacity to theoretically arrest and hold the soluble metal cations found in the dredge wastes, at least until displaced by competing cations.

The Port has presented the findings from two studies evaluating the ability of the natural geologic media to adsorb contaminants in general and to exchange positive cations from the waste leachate. The first study results were submitted in 2004; it was a materials adsorption study of several soil samples entitled “Metals Attenuation Study” dated 6 October 2004. The objective of the study was to show that groundwater cannot be impaired by dredge spoils. However, this study did not address real-world variability of geologic materials. That study examined homogenized clay-soil samples collected from one end of the DMD, with a fixed mass of dissolved metals, in contact with the soil for 48 hours. The study report states "the test does not account for real-world spacial variability in the soil and soil-pore liquid pathways potentially present in the DMD"

The second study results were completed in May and June 2005 and referenced in the 2006 revised report of Waste Discharge (ERS-2, May 2005, and ERS-4, June 2005). The findings of a study which evaluated the resulting metal concentrations from various modifications a 48 hour batch extraction test, the waste extraction test (WET) and the average capacity of the

sites to exchange positive metal ions which would leach from the dredge wastes based on cation-exchange-capactiy tests certain samples and using the SESOIL transport code to model the potential fate of the cations.

A. In the metal cation transport study, the Port prepared two documents evaluating the suitability of the new construction sites for placement of the dredge wastes. However, there were three flaws with this study: (1) the study did not address the fate of arsenic, (2) it misrepresented the pore water concentrations of the all of the dissolved metals leached from the wastes, and (3) the samples that were collected for the cation-exchange-capacity (CEC) analyses were unrealistically biased and resulted in exaggerated test results

1. Arsenic does not exist as a cation in the dissolved state, is not not subject to cation exchange as investigated by the Port, and is present in significant concentrations in the dredge waste materials. Unlike most of the positively charged metals and metal compounds associated groundwater pollution, arsenic in groundwater is primarily either a neutrally charged trivalent oxyanion AsIII, or as a negatively charged pentavalent oxyanion AsIV. Because of its charge, it is not easily adsorbed and arsenic is readily transported through the subsurface.

   General references are made various general properties which may be found in the geologic media which may retard the transport of arsenic through the subsurface into groundwater, however no tests were conducted to evaluate the fate of arsenic.

2. The use of DI-WET analyses underestimates the pore

water concentrations by approximately one order of magnitude. The WET test dilutes the tested soil mass with approximately ten times the mass of de-ionized water. An accurate comparison of the quality of pore water of tested porous media will account for the porosity and specific gravity of the porous media relative to the volume and specific gravity of the dilution water. The diluted results were used in this study underestimating the mass of positive metal cations by an order of magnitude.

3. The study used clay samples to establish the CEC values for the study even though virtually all of the infiltrating water will flow through sands. The geologic materials are highly variable in physical and chemical properties. Previous investigations of hydraulic conductivity by the Port showed that hydraulic conductivity values from sediment samples collect at the DMD and the overflow area ranged from 7.00E-08 cm/s to 2.00E-04 cm/s; a range variation of more than 3 orders of magnitude. Although clay materials are abundant, more than 99% of all infiltrating water will preferentially move through flow paths of the most permeable media.

   In the previous RWD the Port relied on the more permeable nature of these material to infiltrate over 11 million gallons of dredge spoil leachate per month.

   The DMD materials consist of a heterogeneous mixture of soil, sediments and dredge spoils. The different types of materials overlay one another creating channels of preferential flow. The materials consist of a wide range of inter bedded deposits of coarse to fine sediments reworked by flowing waters,

crosscut channels, overbank deposits. Channels of preferentially high flow and high hydraulic conductivity exist in the geologic materials as well.

The study used the analyses of 9 clay samples and 6 samples of fill material, presumably organic, were used. It used exactly zero sand samples. The sandy materials represent the actual media of exposure of the leachate. Clay mineral will have two to 10 times the CEC of a medium sand. Organic matter can have two orders of magnitude greater CEC than that of the sand. The amount of groundwater flowing through the varies porous media is in proportion to the permeability of the media. Given equal thickness of highly transmissive sand and a clay, more 99 percent of the water will flow through the sand and less than one percent will flow though the clay over the same time period.

4. The Study model used an under estimated mass of metal cations, and over estimated CEC, and did not address the transport of arsenic.

IV. With respect to item (4): The Port also compared results of diluted, modified, waste extraction tests (de-ionized water WET) to a broad range of water supply water source chemistry found in San Joaquin county in lieu of establishing background conditions.

A. Comparing DI-WET analyses results to groundwater quality, or even the pore water quality of the tested materials is an erroneous procedure. The use of DI-WET analyses underestimates the pore water concentrations by approximately one order of magnitude. The WET test dilutes the tested soil mass with approximately ten times

the mass of de-ionized water. An accurate comparison of the quality of pore water of tested porous media will account for the porosity and specific gravity of the porous media relative to the volume and specific gravity of the dilution water.

B. Contrary to the implied comparison made in Finding #34, the US EPA does not assess, rank or appraise water quality on the basis of DI-WET analyses, for that matter neither does the State of California. Even to state that the DI-WET results are a screening test does not explain why the results are presented as a tenfold diluted concentration when the dredge spoils will be placed within a few feet of groundwater.

C. Comparison of EPA data to San Joaquin public drinking water systems, and the analogy made in Finding #34 of the WDR's general and unspecified water bodies in the general, yet unspecified region of San Joaquin county to the specific receiving waters associated with the project is a misleading and deceptive procedure.

V. With respect to item (5): The Port presented an informal argument that suggests that the Basin Plan has incorrectly identified c ertain beneficial uses: municipal use, domestic use, and agricultural use as beneficial uses of certain groundwaters of the delta.

A. The Port has made a de facto case for establishing a Containment Zone at Roberts Island.

VI. With respect to item (6): The Port also installed additional monitoring wells and drilled a number of borings to further the definition of groundwater conditions.

A. The assemblage of new monitoring wells and the single round of sampling creates a better picture and shows the results of using Roberts Island as a disposal and dewatering site of dredge spoils for decades. It appears that the greater part of the island's groundwater has been adversely affected by past and current disposal practices. Unfortunately the current round os sampling and analyses exhibit analytical flaws and therefore the results are not reliable.

   For example, I selected for analyses at random and checked the analyses for correctness and accuracy pursuant to Standard Methods procedure. In three out of the four analyses (samples A1-21-sand, E1-16-sand, B1-16-peat, and B-1-21-sand) the calculated values for TDS compared to the reported values were off by ass much in one case 2000%, and the anion-cation balance required in an accurate analysis was not acceptable according to Standard Methods.

VII. CONCLUSIONS

A. The dredge spoils are designated wastes, they contain soluble contaminants that can be released in concentrations exceeding applicable water quality objectives.
B. The wastes will not be underlain by natural geologic materials which are of sufficient thickness to prevent vertical movement of fluid, including waste and leachate, from WMU's or from the new transfer sites at Daggett and Neugebauer roads to waters of the state.
C. The adsorption studies and models presented by the Port in support of its argument that the geologic materials at the site(s) mitigate adverse groundwater impacts are flawed and do not address the issues of transport of arsenic.

D. The reduction in the size, scope, and dredge site locations have not changed the fundamental conclusions that the dredge spoils threaten to discharge pollutants to waters of the State.
E. The WMU's require a liner system which conforms to the requirements of Title 27.

Sincerely

Steve Bond PG, CEG, CHG
President, Steven Bond and Associates, Inc.

Partial list of reviewed and referenced documents

Bond,S, September 2004, Letter to Mr. William Marshall et. al, Subject: Tentative Waste Discharge Requirements for Port of Stockton West Complex Dock Dredging Project, San Joaquin County

Bond,S, October 2004, Letter to Mr. William Marshall et. al, Subject: Tentative Waste Discharge Requirements for Port of Stockton West Complex Dock Dredging Project, San Joaquin County

CVRWQCB,2003 (July), Proposed Order - Tentative Waste Discharge Requirements for Port of Stockton - West Complex, Dredging Project, San Joaquin County, Staff Reports and associated documents

CVRWQCB,2004 (September), Proposed Order - Tentative Waste Discharge Requirements for Port of Stockton - West Complex, Dredging Project, San Joaquin County, Staff Reports and associated documents

CVRWQCB, 2006, Proposed Order - Waste Discharge Requirements for Port of Stockton - West Complex, Docks 14 and 15, Dredging Project, Roberts Island No. 1 Dredged Material Disposal Site San Joaquin County

ERS-1, May 2006, Revised Report of Waste Discharge for the Proposed Dredging of Docks 14 and 15, Port of Stockton - West Complex, Rough and Ready Island, Stockton, California, Environmental Risk Services Corporation.

ERS-2, May 2005, Characterization of Dredge Sediments at Neugebauer Road, Roberts Island Port of Stockton, Stockton, California, Environmental Risk Services Corporation.

ERS-3, June 2005, Roberts No. 1 Ground water Quality Investigation and Monitoring, Roberts Island Port of Stockton, Stockton, California, Environmental Risk Services Corporation.

ERS-4, June 2005, Notice of Intent: Reuse S4 Dredge Sediments at Dagget Road, , Roberts Island and Rough and Ready Island, Port of Stockton, Stockton, California, Environmental Risk Services Corporation.

U.S. Army Corps of Engineers (USACE), January 2003, Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities – Testing Manual